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April 26, 2019

Ex Parte

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Re:

Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, GN Docket No. 18-122

Dear Ms. Dortch,

Ericsson is committed to developing products for 5G in mid-band spectrum. If, however, the two-tranche approach described in the C-Band Alliance ("CBA") filing[1] were adopted by the Commission, it would have a detrimental impact to the development of a 5G ecosystem in the C-band (3.7-4.2 GHz).

The CBA filing describes a "Transition Implementation Process" for making 180 MHz of spectrum available for terrestrial 5G use in a 36-month timeframe.[2] As we have iterated in our past filings, Ericsson believes the future of 5G will be severely impacted by a failure to release large swaths of the C-band and 6 GHz as exclusive-use licensed spectrum.[3] Because the CBA approach does not make nearly enough mid-band spectrum available for 5G and proposes to release the spectrum in a manner that could fragment the C-band, we are not in favor of the proposal.

The proposed plan involves spectrum being cleared and released in two tranches. The first tranche would provide market access to 60 MHz of spectrum available in just 46 top markets. This would be done within an 18-month period after the adoption of a Commission order approving the CBA plan. The second tranche expands the available spectrum in these top 46 markets with an additional 120 MHz of spectrum, giving these 46 top PEA markets access to a total of 180 MHz. In addition, in all other PEAs, a total of 180 MHz of spectrum would be cleared and made available for 5G. The second tranche would become available 18 months following the first one.

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[1] *See* Letter from Jennifer D. Hindin on behalf of the C-Band Alliance, to Marlene H. Dortch, Secretary, FCC, dated April 9, 2019, attaching the C-Band Alliance Transition Implementation Process.
[2] *See id.* at 9.
[3] *See* Reply Comments of Ericsson, *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, at 5 (December 11, 2018) ("Reply Comments of Ericsson").

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Co-channel Interference Concerns

The CBA proposal raises equipment design concerns which will impact the utility of this band for 5G. Because only select PEAs would have access to spectrum in the first tranche, co-channel co-existence between 5G and satellite earth stations would be a concern. In some cases, it may not be possible to protect co-channel use. Ericsson's 2017 study (submitted in the GN Docket 17-183 record) indicates the need for large separation distances that would make any co-channel sharing approach of limited utility.[4] Other data in the record from both terrestrial and satellite interests confirm that sharing spectrum in the band would be extremely challenging,[5] and that significant separation distances would be needed between terrestrial mobile base stations operating co-frequency with fixed satellite system ("FSS") C-Band earth stations.[6] The analysis concluded that at least 30 kilometers of separation (best case scenario), and potentially as high as 50-70 kilometers of separation (less favorable conditions), would be needed between a terrestrial wireless base station and a C-band earth station in order for the two services to co-exist on the same spectrum. Considering that most FSS receivers are located in urban/suburban locations, such large separation distances "eliminate possibilities for co-channel sharing in the populated areas."[7]

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[4] *See* Comments of Ericsson, *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket 17-183, Attachment A, "Co-Channel Sharing Assessment" (filed Oct. 2, 2017) ("Ericsson 3.7-4.2 GHz Co-Channel Sharing Assessment"); *see also*, International Telecommunication Union, *Sharing Studies between IMT-Advanced Systems and Geostationary Satellite Networks in the Fixed-Satellite Service in the 3,400-4,200 and 4,500-4,800 MHz Frequency Bands*, Rep. ITU-R M.2109, § 11, at 41-42 (2007) (minimum required separation distances for co-channel operations are "at least in the tens of kilometres," and minimum required separation distances for adjacent band operations are "up to tens of kilometres"), available at http://www.intelsat.com/wp-content/uploads/2017/10/ITU-SpectrumSharingStudy.pdf .

[5] *See* Joint Reply Comments of Intelsat License LLC and Intel Corporation, *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket 17-183, at 6 (filed Nov. 15, 2017) ("[M]aking spectrum in the 3700-4200 MHz band available on a co-frequency/co-coverage basis for flexible terrestrial use while protecting FSS incumbents will be extremely challenging."); Comments of Nokia, *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket 17-183, at 10-13 (filed Oct. 2, 2017) ("Our preliminary study shows that the required exclusion zones around [fixed earth stations] could be a limiting factor for 5G deployments when 5G and FSS systems are deployed co-channel..."); Comments of the Satellite Industry Association, *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket 17-183, at 34 (Oct. 2, 2017) ("SIA Comments") ("The ubiquity and sensitivity of C-band receive earth stations make sharing of the 3.7-4.2 GHz spectrum with additional terrestrial services extremely difficult.").

[6] *See* Letter from Gerry Oberst, SES Americom, to Marlene H. Dortch, Secretary, FCC, dated March 2, 2018, Technical Annex at 1 ("SES Letter"); Letter from Jeffrey A. Marks, Nokia, to Marlene H. Dortch, Secretary, FCC, dated Jan. 22, 2018, attaching "Mid-Band NOI Technical Inputs," at 20; *See also* SES Letter at 2 (noting that the necessary separation distances "would make deployment of terrestrial mobile services impossible in significant portions of the country," and that co-channel sharing "would create a lose-lose situation for the satellite community and prospective terrestrial service providers").

[7] Ericsson 3.7-4.2 GHz Co-Channel Sharing Assessment at 3.

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Adjacent channel Filter Requirements

Ericsson conducted an adjacent channel study that confirms that coexistence is feasible with a 20 MHz guard band and an OOBE limit of -40 dBm/MHz plus an additional 10 dB shielding or clutter loss at the FSS earth station antenna.[8] This study concluded that adjacent-channel sharing between 5G base station transmitters and FSS earth station receivers was feasible in the C-band.

The C-Band Alliance's Transition Implementation proposal identifies a total of 180 MHz of spectrum for flexible use (i.e., 200 MHz less a 20 MHz guard band). Because the CBA proposal anticipates the release of this spectrum in two separate stages, interim filters will be necessary to mitigate interference to satellite receivers from 5G signals.

The first tranche is stated to include both 60 MHz of spectrum for 5G operation plus a 20 MHz guard band which is defined between 5G signals and adjacent satellite signals. Moreover, the first tranche is intended to allow 5G operators to utilize C-band spectrum between 3700 MHz and 3760 MHz. The guard band will be located at 3760-3780 MHz. Ignoring the issue raised concerning co-channel interference, filters for 5G operation will need to be designed specifically to attenuate 5G signals outside the passband 3700-3760 MHz.

However, once the second tranche of spectrum is implemented, the band will encompass 180 MHz of spectrum—presumably nationwide—for 5G and thereby co-channel interference concerns would be alleviated. However, because the second tranche expands the passband from 60 MHz to 180 MHz, a new filer design will be required. In this case the passband will be 3700-3880 MHz and the guard band will now be 3880-3900 MHz.

Ecosystem Challenges with a Multi-tranche Approach

Although the CBA plan is an attempt to respond to the need for a serious dearth of licensed mid-band spectrum, implementing a plan that clears and makes spectrum available only in certain markets and is delivered in multiple swaths may not improve the timeline for when mid-band spectrum can be deployed. Most importantly, it is questionable whether co-channel concerns can be addressed given the CBA Transition proposal. From a 5G ecosystem perspective, products designed and delivered to support the first tranche must be replaced when the second tranche of spectrum is delivered to support the new passband. Costly development of an interim solution could have a detrimental impact on the timing and availability of 5G products to support the first tranche.

The FCC must consider the implication of releasing spectrum in multiple tranches. The industry has expectations for allocations of the order of 100 MHz per operator in the C-band. When spectrum is released piecemeal, the consequence is fragmentation of the band, and

[8] *See* Reply Comments of Ericsson at Exhibit 1, p. 1.

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possible segmentation of the 5G bands in devices; factors which will severely affect the commercial success of the band. It is also worth considering that spectrum acquisition in two tranches will create a post-market jockeying around trading of allocations, and some number of operators may be prevented from securing contiguous allocations across tranches.

To ensure success of 5G in mid-band spectrum from an eco-system and timeline perspective, the allocation of C-Band spectrum would need to be available on a nationwide basis. Also, to eliminate interim 5G solutions, the spectrum should be available in the same timeframe.

A successful strategy for 5G requires access to a *sufficient* amount of mid-band spectrum. The CBA proposal to release 180 MHz of spectrum for 5G operations fails to address this need. And there is only one immediate opportunity to repurpose a large block of mid-band spectrum – in fact, the 3.7-4.2 GHz band is a critical opportunity for macro 5G deployment necessary to address the growing demand for mobile data that is driving unprecedented growth in mobile broadband services, including 5G.

Respectfully submitted,

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